

Leukocytes

Learning all of these different names and the function of each cell type takes a bit of effort, but you can understand scientific articles a lot better once you get it all figured out! Here's a quick summary to help you get all of the different cell types organized in your brain.

All white blood cells are known officially as **leukocytes**. White blood cells are not like normal cells in the body -- they actually act like independent, living single-cell organisms able to move and capture things on their own. White blood cells behave very much like amoeba in their movements and are able to engulf other cells and bacteria. Many white blood cells cannot divide and reproduce on their own, but instead have a factory somewhere in the body that produces them. That factory is the bone marrow.

Leukocytes are divided into three classes:

- Granulocytes - Granulocytes make up 50% to 60% of all leukocytes. Granulocytes are themselves divided into three classes: neutrophils, eosinophils and basophils. Granulocytes get their name because they contain granules, and these granules contain different chemicals depending on the type of cell.
- Lymphocyte - Lymphocytes make up 30% to 40% of all leukocytes. Lymphocytes come in two classes: B cells (those that mature in bone marrow) and T cells (those that mature in the thymus).
- Monocyte - Monocytes make up 7% or so of all leukocytes. Monocytes evolve into macrophages.

All white blood cells start in bone marrow as **stem cells**. Stem cells are generic cells that can form into the many different types of leukocytes as they mature. For example, you can take a mouse, [irradiate](#) it to kill off its bone marrow's ability to produce new blood cells, and then inject stem cells into the mouse's blood stream. The stem cells will divide and differentiate into all different types of white blood cells. A "bone marrow transplant" is accomplished simply by injecting stem cells from a donor into the blood stream. The stem cells find their way, almost magically, into the marrow and make their home there.

Each of the different types of white blood cells have a special role in the immune system, and many are able to transform themselves in different ways. The following descriptions help to understand the roles of the different cells.

- **Neutrophils** are by far the most common form of white blood cells that you have in your body. Your bone marrow produces trillions of them every day and releases them into the bloodstream, but their life span is short -- generally less than a day. Once in the bloodstream neutrophils can move through capillary walls into tissue. Neutrophils are attracted to foreign material, inflammation and bacteria. If you get a splinter or a cut, neutrophils will be attracted by a process called chemotaxis. Many single-celled organisms use this same process -- chemotaxis lets motile cells move toward higher concentrations of a chemical. Once a neutrophil finds a foreign particle or a bacteria it will engulf it, releasing enzymes, hydrogen peroxide and other chemicals from its granules to kill the bacteria. In a site of serious infection (where lots of bacteria have reproduced in the area), pus will form. Pus is simply dead neutrophils and other cellular debris.
- **Eosinophils and basophils** are far less common than neutrophils. Eosinophils seem focused on parasites in the skin and the lungs, while Basophils carry histamine and therefore important (along with mast cells) to causing inflammation. From the immune system's standpoint inflammation is a good thing. It brings in more blood and it dilates capillary walls so that more immune system cells can get to the site of infection.
- Of all blood cells, **macrophages** are the biggest (hence the name "macro"). Monocytes are released by the bone marrow, float in the bloodstream, enter tissue and turn into macrophages. Most boundary tissue has its own devoted macrophages. For example, alveolar macrophages live in the [lungs](#) and keep the lungs clean (by ingesting foreign particles like smoke and dust) and disease free (by ingesting bacteria and microbes). Macrophages are called langerhans cells when they live in the skin. Macrophages also swim freely. One of their jobs is to clean up dead neutrophils -- macrophages clean up pus, for example, as part of the healing process.
- The **lymphocytes** handle most of the bacterial and viral infections that we get. Lymphocytes start in the bone marrow. Those destined to become B cells develop in the marrow before entering the bloodstream. T cells start in the marrow but migrate through the bloodstream to the thymus and mature there. T cells and B cells are often found in the bloodstream but tend to concentrate in lymph tissue such as the lymph nodes, the thymus and the spleen. There is also quite a bit of

lymph tissue in the digestive system. B cells and T cells have different functions.

- **B cells**, when stimulated, mature into plasma cells -- these are the cells that produce antibodies. A specific B cell is tuned to a specific germ, and when the germ is present in the body the B cell clones itself and produces millions of antibodies designed to eliminate the germ.
- **T cells**, on the other hand, actually bump up against cells and kill them. T cells known as Killer T cells can detect cells in your body that are harboring viruses, and when it detects such a cell it kills it. Two other types of T cells, known as Helper and Suppressor T cells, help sensitize killer T cells and control the immune response.